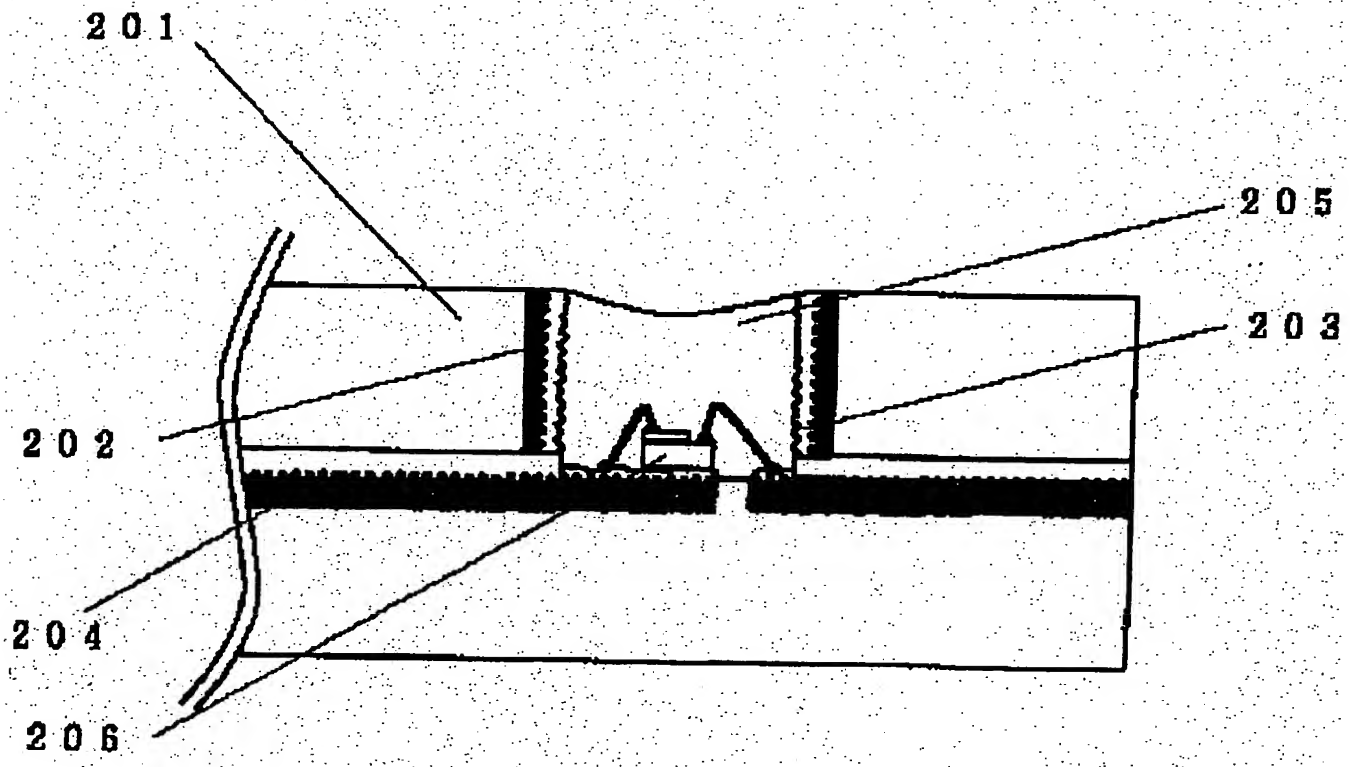
PN - JP10215001 A 19980811
PA - NICHIA KAGAKU KOGYO KK
PD - 1998-08-11
PR - JP19970018275 19970131
OPD - 1997-01-31
TI - LIGHT EMITTING DEVICE
IN - NAGAMINE KUNIHIRO
IC - H01L33/00

PN - JP3316838B2 B2 20020819 DW200261 H01L33/00 007pp
- JP10215001 A 19980811 DW199842 H01L33/00 007pp
PA - (NICH-N) NICHIA KAGAKU KOGYO KK
TI - Light emitting device for indicator of various sensors e.g. line sensor - has coating material comprising first [redacted] layer consisting of refractory [redacted] particles formed on side wall of convex opening and second [redacted] layer overlapping first [redacted] layer
PR - JP19970018275 19970131
IC - H01L33/00
AB - J10215001 The device has a [redacted] package (201) with wiring (204) distributed at its inner side. A convex opening is provided in the [redacted] package. A LED chip (206) mounted at the convex opening portion is connected to the wiring. A coating material (205) covers the convex opening. The coating material includes a first [redacted] layer (202) consisting of refractory [redacted] particles that is formed on the side wall of the convex opening. A second [redacted] layer (203) is formed on the first layer.
- USE - For display of various data.
- ADVANTAGE - Excels in high contrast and light emission. Doe reliable light emission.
- (Dwg.2/4)
OPD - 1997-01-31
AN - 1998-491841 [42]

PN - JP10215001 A 19980811
PA - NICHIA CHEM IND LTD
PD - 1998-08-11
AP - JP19970018275 19970131
IN - NAGAMINE KUNIHIRO
TI - LIGHT EMITTING DEVICE
AB - PROBLEM TO BE SOLVED: To increase the contrast and the light emitting efficiency and to improve reliability by forming the first [redacted] layer constituted of high-melting-point particles on the sidewall of a concave opening part and the second [redacted] layer on the first [redacted] layer.

- SOLUTION: The metallic layer, which reflects the light from a LED chip 206, is functionally separated as the adhesion and [illegible] with ceramics. By setting the metal particles as the first metal layer 202, the adhesion can be improved. Furthermore, the second metal layer 203, which is provided at the side wall of the concave opening part, can improve the [illegible] efficiency of the light. That is to say, by providing the first and second metal layers 202 and 203 at the side wall of the concave opening part, the loss of the light intruding into a ceramic package 201 can be decreased. Furthermore, since the light emission other than the opening part is prevented, the contrast in the displays and the like can be improved. Furthermore, the effects of water resistance and stress alleviation by the improvement in a coating resin 205 and the ceramic package 201 are excellent.

- H01L33/00



[Detailed Description of the Invention]

[0001]

[Field of the Invention] About the luminescence equipment used for the light source, an indicator, etc. of various sensors, such as a display, a line sensor, etc. which can display various data, especially, the invention in this application is excellent in high contrast and luminescence ****, and relates to reliable luminescence equipment.

[0002]

[Description of the Prior Art] The LED chip which can emit light in the super-high brightness which amounts to 1000 or more mcds in RGB (a red system, a green system, blue system) was developed today, respectively. In connection with this, it can consider as the LED drop which can be displayed full color because RGB (a red system, a green system, blue system) carries out color mixture luminescence using the LED chip which can emit light, respectively. Specifically, it is used for the character representation plate used out of full color large-scale image equipment or indoor. In the JIS level 2 kanji set etc., in order to display a complicated alphabetic character, a high definition drop is called for especially. Moreover, it is also called for that it is the drop which can be checked by looking from an include angle with the outside of indoor quite large for the application of the destination plotting board etc.

[0003] a high definition and a high angle of visibility -- and small -- a thin shape -- the luminescence equipment which has arranged the LED chip in the package of a ceramic can be considered as luminescence equipment [-izing / equipment]. The outline perspective view of the dot-matrix-like LED drop using such a ceramic substrate is shown in drawing 1 . The package which used the ceramic as the base can be formed comparatively easily by calcinating what carried out the laminating of the raw material called a green sheet to the multilayer. The luminescence equipment which carried the LED bare chip on this package base can attain highly minute-ization which becomes below 6mm pitch by carrying an LED chip in high density.

[0004] Moreover, if it is made highly minute, the calorific value from an LED chip will become large, but since the heat dissipation nature of a ceramic is good, the dependability

of an LED chip is also securable. Furthermore, the thing using a ceramic can also make wiring form in package formation and coincidence simply by printing a tungsten paste etc. in the shape of a green sheet. Therefore, high density wiring can also be carried out at a comparatively high definition dot-matrix configuration etc. In a ceramic substrate, since formation of concave opening is easy, it has the advantage that the resin seal for protection of an LED chip loading part can be performed easily. Since luminescence of the omnidirection of an LED chip can use an LED bare chip by carrying directly as compared with a shell mold LED lamp, production of the display of a high angle of visibility is possible.

[0005]

[Problem(s) to be Solved by the Invention] However, a ceramic penetrates a certain amount of light from a ceramic presentation, the compactness of a sintered compact, etc. Therefore, the light to which the direction of an LED tip side side was emitted as shown in drawing 4 advances into the side-attachment-wall section of a ceramic in part. The light which advanced into the side-attachment-wall section of a ceramic penetrates a surface layer, being scattered about. Therefore, when luminescence equipments, such as a display, are observed from a transverse plane, luminescence of the shape of a weak ring is looked at by the periphery of concave opening. It becomes the cause by which this reduces contrast in the luminescence equipment using a ceramic package.

[0006] Similarly, it is thought that loss of the light within a ceramic package increases. Moreover, a ceramic package, the organic resin which is a coating member have bad adhesion. Furthermore, ceramics differ in a coefficient of thermal expansion with a coating member greatly. Therefore, it has the problem of being easy to produce exfoliation prevention of the coating material by the heat stress at the time of a temperature cycle etc. Therefore, the invention in this application solves the trouble in the luminescence equipment which used the ceramic substrate, and high contrast and luminescence **** are excellent, and it is to offer reliable luminescence equipment.

[0007]

[Means for Solving the Problem] the invention in this application -- a conductor -- the inside of the substrate which arranges wiring on the interior and has concave opening, and this concave opening -- said conductor -- the LED chip electrically connected with

wiring, and the 1st metal layer which is luminescence equipment which closed said concave opening by the coating member, and consists of refractory metal particles on said concave opening side attachment wall -- this -- it is luminescence equipment which has the 2nd metal layer on the 1st metal layer. Moreover, while said 1st metal layer is deposition of a refractory metal particle, the 2nd metal layer is also a metal deposit which reflects the light from an LED chip 90% or more at least. furthermore, the luminescence equipment whose mean particle diameter of said refractory metal particle is 0.3 to 100 micrometers -- it is -- said conductor -- wiring and said 1st metal layer ingredient are also the same luminescence equipment substantially.

[0008]

[Function] The invention in this application carries out functional separation of the metal layer which reflects the light from an LED chip at adhesion and reflexibility with the ceramics etc. Specifically, adhesion can be raised by using metal particles as the 1st metal layer. Moreover, the 2nd metal layer prepared in that of a concave opening side attachment wall can improve the reflective effectiveness of light. That is, the optical loss which was advancing into the ceramic package can be reduced by preparing the 1st of a concave opening side attachment wall, and the 2nd metal layer. Moreover, since luminescence of those other than the inside of concave opening was prevented, improvement in the contrast of a display etc. was attained.

[0009] It is possible to improve the further reflective effectiveness etc. by forming the side-attachment-wall conductor layer for reflection not only in a perpendicular configuration but in a concave taper configuration or a concave curved-surface configuration by adjusting the viscosity of the paste which the refractory metal contained at the time of side-attachment-wall printing of green sheet opening. The surface smoothness on the front face of a reflecting layer can be changed by similarly adjusting the particle size of the metal powder contained in the conductive paste at the time of side-attachment-wall printing. It is possible for this to also give the light-scattering effectiveness.

[0010] Originally a ceramic substrate and the organic resin which is a coating member are controlling the surface roughness of the side-attachment-wall section of the invention in this application, although adhesion's is bad, and it became possible to improve

adhesion. Thereby, the improvement effectiveness of dependability, such as improvement in closure airtightness and exfoliation prevention of the coating material by the heat stress at the time of a temperature cycle, is expectable.

[0011]

[Embodiment of the Invention] An invention-in-this-application person is a ceramic as a result of various experiments. By performing wall surface processing to the concave opening circles in a package, it came to accomplish the header invention in this application for a luminescence property and dependability improving by leaps and bounds.

[0012] That is, in the luminescence equipment which used the ceramic ingredient for the package, luminescence of the shape of a ring which penetrates a ceramic and is produced in a luminescence observation side side is controllable by making a metal layer form in a part of the opening wall surface [at least]. When making a metal layer form in one especially with a ceramic, it is desirable to use a refractory metal. However, a refractory metal does not necessarily reflect the light from an LED chip efficiently. The invention in this application can attain efficient luminescence and dependability by carrying out functional separation of adhesion and reflexibility with a ceramic. Moreover, by choosing the irregularity on the front face of a side attachment wall, adhesion with a coating member can also be controlled and it becomes few highly at the time of the thermal expansion of resin exfoliating [of the coating section] dependability.

[0013] The configuration of a request on a green sheet is made to specifically print the resin paste which the tungsten contained. Concave opening is made to form by carrying out the laminating of the green sheet which made opening in agreement to a multilayer, and carrying out hot press in a vacuum. The resin paste which the tungsten contained is made to apply to the side attachment wall of concave opening. It can consider as the concave curved-surface configuration opened toward the exterior by making viscosity adjust. The package of a ceramic is formed by calcinating such a green sheet. Die bond of the LED chip is carried out to the base of concave opening of a ceramic package with an epoxy resin. Wire bonding of the electrode of an LED chip and the conductive pattern prepared in the ceramic package is carried out. The light emitting device of the invention in this application can be made to form in opening circles by carrying out impregnation

hardening of the epoxy resin. Hereafter, many things are explained in full detail about the requirements for a configuration of the invention in this application.

[0014] (Ceramic packages 201 and 301) In the ceramic packages 201 and 301 used for the invention in this application, in order to protect the LED chips 206 and 306 from an external environment etc., while being formed with a ceramic ingredient and arranging an LED chip inside, the member which connects an LED chip and the exterior electrically is prepared. 90 - 96% of the weight of raw material powder is specifically an alumina. As sintering acid Viscosity, The ceramics which talc, a magnesia, calcia, a silica, etc. are added four to 10% of the weight, and was made to sinter in a 1500 to 1700-degree C temperature requirement, and 40 - 60% of the weight of raw material powder as sintering acid with an alumina 60 - 40% of the weight of borosilicate glass, a KOJU light, forsterite, The ceramics which a mullite etc. is added and was made to sinter in the temperature requirement which is 800-1200 degrees C is mentioned.

[0015] Such a package can take configurations various in the green sheet phase before baking. Wiring in a package carries out screen-stencil etc. to the configuration of a request of the paste-like thing which made the resin binder contain refractory metals, such as a tungsten and molybdenum. This is wiring by ceramic baking. Opening which makes an LED chip contain can also be made to form freely by making the green sheet which carried out opening rival in a multilayer etc. Therefore, it is also possible to form a stair-like opening side attachment wall etc. by carrying out the laminating of the green sheet with which it sees from a luminescence observation side side, and the shape of the shape of a circle and an ellipse differs from an aperture. When spreading etc. uses as a side attachment wall the resin paste of the refractory metal content which constitutes wiring, it can also form as the 1st metal. It can consider as the package formed with the ceramics by making such a green sheet sinter. Moreover, it can be made a dark color system by making the green sheet itself contain Cr 2O3, MnO2, TiO2, Fe 2O3, etc.

[0016] Concave opening of a package arranges an LED chip, a conductive wire, etc. inside. Therefore, while direct loading etc. carries out an LED chip by a die bond device etc., there should just be sufficient magnitude which can take electrical installation with an LED chip by wire bonding etc. concave opening -- a request -- responding -- two or more -- more than one can be prepared. The shape of a dot matrix or a straight line etc. of

16x16 or 24x24 can be made to specifically choose variously. the dot pitch of concave opening -- quantity 4mm or less -- when minute, as compared with the case where a shell mold LED lamp is carried, the dot pitch should contract sharply moreover, such [in the configuration of the invention in this application] quantity -- even if it sets minute, the various problems relevant to the heat dissipation nature from an LED chip are solvable. Thermosetting resin etc. can perform adhesion with an LED chip and a package pars basilaris ossis occipitalis. Specifically, an epoxy resin, acrylic resin, imide resin, etc. are mentioned. Moreover, in order to make it connect with wiring, such as a face down LED chip, electrically, Ag paste, an ITO paste, carbon paste, a metal bump, etc. can be used.

[0017] (1st metal layer 202 and 302) The 1st metal layer 202 and 302 serves as the substrate of making the 2nd metal layer forming while it touches a ceramic package directly and is formed. Therefore, it is necessary not to fuse the 1st metal layer formed in ceramic baking and coincidence as mentioned above at the time of ceramic formation. As a refractory metal used for such 1st metal layer, a tungsten, chromium, titanium, cobalt, molybdenum, these alloys, etc. are mentioned. The 1st metal layer can be formed by making a resin paste mix these metal particles, carrying out spreading or printing to the concave opening side attachment wall of a green sheet, and calcinating with a green sheet. To the 2nd metal pan formed on a ceramic or the 1st metal, adhesion with the coating member formed on it is also controllable by controlling the particle size of metal particles. The 2nd metal surface roughness formed on it is also controllable by the metal particle size used for the 1st metal. Therefore, as a particle size of the 1st metal particles, it is desirable that it is 0.3 to 100 micrometers, and 1 to 20 micrometers is more desirable.

[0018] moreover, various side-attachment-wall configurations of a ceramic package can be boiled and controlled by making the viscosity of the resin paste which the metal particles used for the 1st metal layer contained adjust. That is, as long as a ceramic package is the laminating of a green sheet, it is difficult to make an opening side attachment wall into a taper configuration. Therefore, even if it makes a metal layer only form, it cannot consider as the configuration where a reflection factor is high on the whole surface.

[0019] In the invention in this application, it can consider as straight-line-like the taper configuration or concave curved-surface configuration opened toward the exterior from

the interior of a ceramic package by making the paste of refractory metal particle content adjust with viscosity. The side attachment wall which spread toward opening can raise the further reflection factor. the taper angle on the straight line which was suitable for optical reflection in order that the side-attachment-wall configuration of concave opening might avoid loss of luminescence from an LED chip, or a curved surface -- or suppose that it is stair-like. In order to make the configuration of such a side-attachment-wall reflecting layer into a taper configuration or a concave curved-surface configuration, it can be made to form suitably by making various printing speed adjust in the range of viscosity 5000-20000ps.

[0020] Moreover, after flowing and embedding conductive paste completely at opening of a green sheet as the approach of reflective conductor-layer formation other than side-attachment-wall printing, the approach of perforating a side attachment wall by laser in an opening core in the range which leaves a conductor layer may be used. In this case, as the laser light source, carbon dioxide laser and an YAG laser, an excimer laser, etc. are mentioned suitably. Furthermore, it is not necessary to make the 1st metal layer not necessarily form all over a side attachment wall. Only the request direction reflects light by not making the 1st and 2nd metal layers form partially. It seems that the ceramic was penetrated and light spread to the part in which the metal layer is not formed. Thus, an angle of visibility can also be extended in the request direction by making the metal layer made to form in a side attachment wall form partially.

[0021] (2nd metal layer 203 and 303) The 2nd metal layer 203 and 303 of the invention in this application is made to form on the 1st metal layer 202 and 302, and it has a reflex function for taking out efficiently outside the light emitted from the LED chips 206 and 306. Such 2nd metal layer can be made to form comparatively simply on the 1st metal layer using plating, vacuum evaporationo, etc. Specifically, the metal which has 90% or more of reflection factor to the light emitted from LED chips, such as gold, silver, platinum, copper, aluminum, nickel, palladium, and those alloys, those multilayers, is suitably mentioned as 2nd metal layer.

[0022] the 2nd metal layer -- ceramic the conductor wired in the package -- the surface treatment of a circuit pattern -- simultaneously, it can also be made to form namely, ceramic the conductor prepared in the package -- in consideration of solder connectability

etc., about nickel/Ag or nickel/Au, the 2nd metal stratification, simultaneously also when making it plate, it is in wiring. Moreover, electroplating may be separately performed for formation of the 2nd metal layer, and the front face of electric conduction wiring.

[0023] (LED chips 206 and 306) The thing which the LED chips 206 and 306 used for the invention in this application made form semi-conductors, such as GaAlN, ZnS, ZnSe, SiC and GaP, GaAlAs, AlN and InN, AlInGaP, InGaN, GaN, and AlInGaN, as a luminous layer on a substrate is used. As structure of a semi-conductor, the thing of a terrorism configuration is mentioned to gay structure, hetero structure, or double with MIS junction, PIN junction, or a PN junction. Luminescence wavelength can be variously chosen from ultraviolet radiation to infrared light by whenever [ingredient or its mixed-crystal]. [of a semi-conductor layer] A luminous layer is good also as the single quantum well structure used as the thin film which the quantum effectiveness produces, or multiplex quantum well structure.

[0024] the case where field use is taken into consideration -- high -- although it is desirable to use a gallium nitride system compound semiconductor for green and blue as a brightness semiconductor material and it is desirable to use the semi-conductor of gallium aluminum and an arsenic system and the semi-conductor of an aluminum in JUUMU gallium and a phosphorus system in red, it cannot be overemphasized that many things can be used by the application.

[0025] When a gallium nitride system compound semiconductor is used, ingredients, such as sapphire, a spinel, and SiC, Si, ZnO, a GaN single crystal, are used for a semi-conductor substrate. In order to make crystalline good gallium nitride form with sufficient mass-production nature, it is desirable to use a sapphire substrate. The example of an LED chip using a nitride system compound semiconductor is shown. Buffer layers, such as GaN and AlN, are formed on a sapphire substrate. It can consider as the configuration which formed in order the 2nd contact layer which is GaN of the cladding layer which is AlGaN of the 1st contact layer which is N or GaN of P type on it, the barrier layer which is the InGaN thin film which has the quantum effectiveness, P, or N type, P, or N type. A gallium nitride system compound semiconductor shows N type conductivity in the condition of not doping an impurity. In addition, when making the N type gallium nitride semi-conductor of a request, such as raising luminous efficiency,

form, it is desirable to introduce Si, germanium, Se, Te, C, etc. suitably as an N type dopant.

[0026] On the other hand, when making a P type gallium nitride semi-conductor form, Zn, Mg, Be, calcium, Sr, Ba, etc. which are P type DOPANDO are made to dope. Since itis [P-type-] hard toize a gallium nitride system semi-conductor, it is necessary to make it P-type-ize only by doping a p-type dopant by annealing by heating, the low electron beam irradiation, the plasma exposure, etc. at a furnace after p-type dopant installation. In this way, etching etc. makes partial the formed semi-conductor wafer, and each electrode of positive/negative is made to form. An LED chip can be made to form by cutting a semi-conductor wafer in desired magnitude after that.

[0027] Two or more such LED chips can be used by request, and can also raise the color mixture nature in a white display with the combination. For example, it can make into one piece at a time the LED chip with which two pieces, a blue system, and a red color system can emit light for the LED chip with which a green system can emit light, respectively. In addition, in order to use as full color luminescence equipment for displays, it is desirable that 610nm to 700nm and the luminescence wavelength of a green system are [495nm to 565nm and the luminescence wavelength of a blue system] 430nm to 490nm for the luminescence wavelength of a red system.

[0028] (Coating members 205 and 305) The coating members 205 and 305 are for making the light from an LED chip emit outside efficiently while they are allotted in opening of a ceramic package and protect an LED chip from external force, moisture, etc. from an external environment. As a concrete ingredient which constitutes such a coating member, transparence resin, glass, etc. excellent in weatherability, such as an epoxy resin, a urea resin, and silicone, are used suitably. When an LED chip is arranged to high density, it is more desirable to use an epoxy resin, silicone resin, those combined things in consideration of an open circuit of the conductive wire by the thermal shock etc. Moreover, in order to increase an angle of visibility further, a dispersing agent may be made to contain in a coating member. As a concrete dispersing agent, barium titanate, titanium oxide, an aluminum oxide, oxidation silicon, etc. are used suitably. Moreover, organic, an inorganic coloring color, and a color pigment can be made to contain in order to cut the wavelength besides a request. Furthermore, the fluorescent material which

carries out wavelength conversion of a part of light [at least] from an LED chip can also be made to contain.

[0029] (Conductive wire) the conductor prepared in the electrode and ceramic package of an LED chip as a conductive wire -- it is one sort of the electrical installation member to which wiring is connected, and what has ohmic nature, mechanical-connections nature, good electrical conductivity, and good thermal conductivity is called for. As thermal conductivity, more than 0.01 cal/cm2/cm/degree C is desirable, and it is more than 0.5 cal/cm2/cm/degree C more preferably. Moreover, in consideration of workability etc., the diameters of a conductive wire are more than phi10micrometer and less than [phi45micrometer] preferably. Specifically, the conductive wire using metals and those alloys, such as gold, copper, platinum, and aluminum, as such a conductive wire is mentioned. Such a conductive wire can connect easily the conductive pattern prepared in the substrate by the wire-bonding device to the electrode of each LED chip. It cannot be overemphasized that it is not that by which the invention in this application is hereafter limited only to this although the concrete example of the invention in this application is explained in full detail.

[0030]

[Example]

(Example 1) As luminescence equipment, the ceramic package which has concave opening of 16x16 in the shape of a dot matrix was used. the hole concave opening does not have [hole] a wiring layer at the time of ceramic package formation -- the aperture green sheet was made to form by carrying out a laminating The wiring layer was made to form by making a desired configuration screen-stencil the resin paste of tungsten content. (In addition, the thing with a mean particle diameter of about 1 micrometer is used for the tungsten.) Viscosity of a resin paste was set to about 30000 ps(es).

[0031] In superposition and a vacuum, hot press of each green sheet to which opening was equal was carried out, and it carried out temporary formation. After opening was formed, the tungsten resin paste which makes the side attachment wall of opening constitute the 1st metal layer was applied. The same tungsten particle as what was used for the wiring layer was used for the 1st metal layer. The viscosity of the tungsten paste printed by the side attachment wall lowered viscosity a little so that it might be easy to

flow by about 10000 ps(es) at the time of side-attachment-wall printing. in addition, the 1st metal layer and a conductor -- the green sheet for an electric insulation of a circuit pattern was constituted so that a reflection factor might not fall by about 150 micrometers in thickness.

[0032] Ceramics with which the 1st metal layer was formed by making this sinter The package was made to constitute. next -- as the 2nd metal layer -- the 1st metal layer and a conductor -- the exposure front face of a circuit pattern was made to carry out electroplating of the nickel/Ag multilayers, respectively Ceramic of the overall-length the angle of 48mm of dot pitch 3.0mm which is concave opening by this, diameter of opening 2.0mmphi, an opening depth of 0.8mm, and 16x16 dot matrices The package was formed. Ceramic The partial cross section of a package was the concave curved-surface configuration opened toward the exterior like drawing 3 . Ceramic The electric ejection with an external electrode formed the contact pin by metal covar by silver solder connection from the package.

[0033] On the other hand, the InGaN semi-conductor whose main luminescence peak is 450nm was used as an LED chip which is a semi-conductor light emitting device. the sapphire substrate top which made the LED chip wash -- TMG (trimethylgallium) gas, TMI (trimethyl in JUUMU) gas, nitrogen gas, and dopant gas -- carrier gas -- a sink and MOCVD -- it was made to form by making a gallium nitride system compound semiconductor form by law The gallium nitride semi-conductor which has N type conductivity, and the gallium nitride semi-conductor which has P type conductivity were formed, and the PN junction was made to form by changing SiH4 and Cp2Mg as dopant gas. (In addition, annealing of the P-type semiconductor has been carried out above 400 degrees C after membrane formation.)

[0034] After exposing PN each semi-conductor front face by etching, each electrode was made to form by the sputtering method, respectively. In this way, after lengthening a scribe line, external force was made to divide the done semi-conductor wafer, and the LED chip was made to form as a light emitting device. It is a ceramic with an epoxy resin about the LED chip with which this blue system can emit light. It was made to fix to the predetermined base in package opening according to heat curing after die bonding. Then, electrical installation was taken by carrying out wire bonding of the gold streak to each

electrode of an LED chip, and wiring on a substrate. Silicone resin was made to pour into the concave opening circles by which the LED chip has been arranged, respectively. Silicone resin was stiffened in 130-degree-C 1 hour, and the coating member was made to form after impregnation. The luminescence equipment at this time is the ceramics. There was only about 2.0mm thickness of a package and large thin-shape-izing was possible for it as compared with the display unit of shell mold LED lamp use.

[0035] The driving means of CPU equipped with the driver which it is switched [driver] with the output signal of the gradation control circuit which calculates the gradation signal for making predetermined brightness turn on an LED chip from the data memorized by RAM (Random, Access, Memory) and RAM which make the indicative data inputted as this luminescence equipment memorize temporarily, and a gradation control circuit, and makes each LED chip turn on was connected electrically. Even if it supplied power to this luminescence equipment continuously over 500 hours, there was almost no change in a luminescence property. Next, the drive circuit was removed and the gaseous-phase spalling test was performed only as luminescence equipment. A gaseous-phase spalling test is 500 cycle ****** about the gaseous-phase thermal shock which makes 1 cycle temperature time amount [of -40 degrees C] 30min, and temperature time amount [of 100 degrees C] 30min. Peeling of the coating member in opening after a gaseous-phase spalling test was not checked. In all openings, peeling was not checked but was able to be again driven as an LED display equipment.

[0036] (Example 1 of a comparison) Except having not made the 1st metal layer of the invention in this application form, but having made only the 2nd metal layer form by vacuum evaporationo, it formed like the example 1 and the gaseous-phase spalling test was performed. The metal layer is formed stair-like and, as for after the gaseous-phase spalling test, the vacuum evaporationo side had the part which is not turned on. As a result of investigating the part non-switched on the light, it has checked that the coating section had floated and the conductive wire was disconnected.

[0037]

[Effect of the Invention] The invention in this application can be used as the luminescence equipment which has a high angle of visibility, a high definition, the formation of a small thin shape, and high-reliability. By considering as the configuration

of claim 1 especially, while reflecting the light from an LED chip efficiently, it can consider as the luminescence equipment with which adhesion with the coating section etc. is compatible. Therefore, coating resin and a ceramic It has effectiveness, such as a water resisting property by improvement in the adhesion of a package, and stress relaxation at the time of a temperature cycle.

[0038] By considering as the configuration of the invention in this application according to claim 2, luminescence **** can consider as the good luminescence equipment of mass-production nature high more.

[0039] By considering as the configuration of the invention in this application according to claim 3, it can consider as reliable luminescence equipment.

[0040] By considering as the configuration of the invention in this application according to claim 4, it can consider as the high luminescence equipment of mass-production nature more.

[0041]

[Claim(s)]

[Claim 1] a conductor -- the ceramic package which arranges wiring on the interior and has concave opening, and the inside of this concave opening -- said conductor -- the LED chip electrically connected with wiring, and the 1st metal layer which is luminescence equipment which closed said concave opening by the coating member, and consists of refractory metal particles on said concave opening side attachment wall -- this -- the luminescence equipment characterized by to have the 2nd metal layer on the 1st metal layer.

[Claim 2] Luminescence equipment according to claim 1 which is the metal deposit in which the 2nd metal layer reflects the light from an LED chip 90% or more at least while said 1st metal layer is deposition of a refractory metal particle.

[Claim 3] Luminescence equipment according to claim 2 whose mean particle diameter of said refractory metal particle is 0.3 to 100 micrometers.

[Claim 4] said conductor -- wiring and said 1st metal layer ingredient -- substantial -- the same luminescence equipment according to claim 1.